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(54) A CATHETER SUCH AS A BLADDER CATHETER

(71) We, BYK GULDEN LOMBERG CHEMISCHE FABRIK GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, of Byk-Gulden Strasse 2, D-7750 Konstanz, Federal Republic of Germany, a German body corporate do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a catheter, for example a bladder catheter, comprising a tube, and, mounted on one end of the tube or forming a continuation of the tube, an exsertable elastic pipe which is invaginated into the interior of the tube.

Proposals have already been made to line body cavities as for example the urethra by means of a lining member which can be exserted, that is to say caused to protrude, by pressure media in order to be able to introduce instruments such as a catheter into the body cavity lined in this fashion subsequently or at the same time as the exsertion of the lining member (see for example the U.S. Patent Specification 3,589,356, and the German Patent Specification (Offenlegungsschrift) 2,021,634).

Catheters which are introduced in accordance with this principle are particularly suitable for use with female patients for the removal of urine from the bladder and for the introduction of medicaments in a liquid form. They offer the advantage that, in the case of the introduction of the catheter into the bladder, owing to the exsertion of the pipe by hydraulic pressure there is a complete avoidance of any sliding movement in the urethra and accordingly there is no effective possibility of any infective material which may be present in the urethra being entrained into the bladder, and there is accordingly no possibility of bladder infection. The practical performance of the above-mentioned previously-proposed catheterisation is, however, complicated and not without danger. Owing to the substantial friction between the pipe being exserted and the tube there is a danger of the operator losing his sense of feel for restricted passages and curves in the urethra, something which can lead to damage of the latter.

What is desired is a further development of the previously proposed catheter (comprising a tube and, invaginated into the tube, an exertable pipe which is connected to one end of the tube) in such a manner that catheterisation can be carried out substantially without any danger to the patient and in a substantially simpler manner while reducing constructional complexity.

The present invention provides a catheter comprising a tube, and, mounted on one end of the tube or forming a continuation of the tube, an exsertable elastic pipe which is invaginated into the interior of the tube, the free end of the pipe being invaginated into the pipe to constitute a closure which automatically opens when the free end is exposed during exsertion of the pipe.

The end of the tube, opposite to the pipe connection, is preferably connectable with the spigot or nozzle of a piston-type syringe or other device for producing h draulic pressure.

It is possible for the construction to be such that the closure is a lip valve, for example, which is formed by obliquely cutting the end of the pipe and invaginating the resulting tapered lip bent back on itself in the form of a letter S. Alternatively, the closure may be formed by means of an oblique cut on one side of the originally closed end of the pipe, which end is invaginated to a slight extent in the direction of the pipe axis. In the case of the latter

embodiment, after opening of the closure a lateral port or aperture, termed a catheter eye, is produced. The tube may be provided at the end accepting the pipe with a groove or ridge over which the mounted pipe end is secured by a cuff with an internal peripheral rib or by a spring ring or by another clamping means. The tube is preferably constructed so as to be rigid or semi-rigid and is made, e.g. of plastics material, metal, or glass; plastics material is preferred.

The tube and the pipe can naturally be connected also by other methods, by adhesion or welding for example. Preferred embodiments of the invention include a construction in which the tube and the pipe are integral with each other.

A catheter can be produced in which the pipe serves as a bladder catheter and which owing to its resulting economic production can be thrown away after being used once. Furthermore it is possible for preferential use to be made of catheterisation by means of a pipe which is exserted, because the introduction of the catheter is substantially less uncomfortable than conventional methods of investigation, and troublesome complications occurring after catherisation need no longer occur. Owing to its simple construction and its easy application the catheter may be used without any danger by nursing personnel.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:—

Figure 1 is a longitudinal section view of a catheter mounted on the nozzle of a syringe;

Figure 2 is a diagrammatic perspective view, partly broken away, of the catheter of Figure 1, on being half introduced into the bladder;

Figure 3 is a longitudinal sectional view of a slightly modified catheter, after complete protrusion of the pipe;

Figure 4 shows a perspective view of the closure at the end of another embodiment of a catheter;

Figure 5 is similar to Figure 4 and shows the end open; and

Figure 6 is a section through the catheter end shown in Figure 4 illustrating the way in which the valve is made.

Each of the catheters illustrated comprises an elastic pipe 1 made of a silicone compound or another suitable material (for example latex rubber), and a rigid or semi-rigid tube 2 manufactured of any suitable material (e.g. plastics material). The tube 2 has the pipe 1 fitted to it and is constructed with suitable dimensions for this purpose.

Before the fitting of the pipe 1 to the rigid or semi-rigid tube 2 the pipe is completely invaginated or turned inside out. One end 1*b* of the pipe 1 is then introduced into the tube 2 and the distal end 1*a* of the pipe is slipped over the adjacent end 2*a* of the tube (Figure 1). (The pipe 1 can, alternatively, be mounted on the end 2*a* of the tube 2 before being invaginated into the interior of the tube 2.) For improved holding in position of this pipe end 1*a* fitted over the adjacent tube end 2*a*, the end 2*a* has on its outside an annular recess or groove 3, or a ridge or other projection, over which the turned over pipe end 1*a* is held in place by a cuff 4 or a spring ring 5*a*. The cuff 4 can be made so as to be elastically resilient and on the inner side it has a peripheral rib 5 (optional) which cooperates with the groove 3 (or ridge), and presses the pipe end 1*a* into the groove (or onto the ridge).

Owing to the invagination of the pipe before or after it is introduced into the tube 2, the pipe becomes softer and more pliant than in the original condition. It is by the use of these features that it is possible furthermore for the free end 1*b*, not attached on the tube 2, of the pipe to be constructed as a closure 6 which automatically opens on exsertion or protrusion (i.e. the closure opens at the end of the exsertion procedure).

In the catheter of Figures 1 to 3, this closure 6 is in the form of a so-called lip valve. A tapering lip 11, formed by cutting off of the free pipe end 1*b* along an oblique surface 10, is so invaginated (Figures 1 and 2) into the interior of the invaginated pipe that it is bent back on itself and takes the form of a letter S (Figure 1) and hermetically seals this end 1*b* of the pipe. The end of the lip 11 lies against the opposite inner wall of the invaginated pipe and points towards the end of the pipe. This closure 6 opens automatically when the pipe is caused to protrude, i.e. is exserted, by hydraulic pressure (see Figures 2 and 3); the closure 6 opens when that part of the pipe forming the closure is exposed at the end of the exsertion procedure.

An alternative closure can be constructed by using a pipe (Figures 4 to 6) which at the free end 1*c* is closed. The pipe end, as shown in Figure 6 in longitudinal section, is invaginated in the direction to the longitudinal axis of the pipe and a piece is cut off obliquely, as indicated by the broken line AB.

At least the end 2*b* of the tube 2, remote from the pipe connection, is so constructed that it can be mounted in a substantially hermetically sealing fashion on the nozzle 7 of a conventional piston type syringe 8 producing hydraulic pressure.

The protrusion or exsertion of the catheter pipe of Figures 1 to 3 so as to bring it out of the position shown in Figure 1 and into that shown in Figure 3 can be facilitated (that is to say the hydraulic pressure to be applied can be reduced) by all or some of the following measures (not illustrated):

(a) The pipe 1 is preferably tapered, that is to say its external diameter decreases towards the closure 6 but the part of the pipe which forms the closure should have an approximately constant diameter.

(b) The wall thickness of the pipe 1 is preferably arranged to vary along the length, that is to say it decreases towards the closure 6.

(c) The inner surface of the catheter pipe 1 in the position shown in Figure 1 is the original outer side of the pipe used for production of the catheter. As a result on protrusion the pipe 1 on moving into the position shown in Figure 3 turns round in such a manner that the originally outer side of the pipe becomes the outer side of the catheter pipe again.

The piston-type syringe can be a throw-away syringe and for causing protrusion of the pipe is generally filled with a sterile sodium chloride solution or sterile distilled water. If the filled piston syringe is applied to the free end 2*b* of the tube 2, even in the case of the application of a small piston pressure the pipe 1, is caused to protrude out of the tube 2 and — providing that pressure continues to be applied — the protrusion is continued so that the pipe extends through the urethra and enters the bladder. In the catheter of Figures 1 to 3, the lip 11 of the lip valve is exserted so that the sealing action ceases. In the case of the alternative closure it is to be pointed out that after the exsertion of the pipe a lateral opening 9 (catheter eye) is freed (Figure 5). The catheter then lies in an open condition in the bladder and the nozzle 7 can be detached from the pipe. In the case of the use of a syringe permanently connected to the tube the piston of the syringe can be removed from the syringe barrel, for example to allow urine to pass from the bladder through the syringe barrel.

WHAT WE CLAIM IS:—

1. A catheter comprising a tube, and, mounted on one end of the tube or forming a continuation of the tube, an exsertable elastic pipe which is invaginated into the interior of the tube, the free end of the pipe being invaginated into the pipe to constitute a closure which automatically opens when the free end is exposed during exsertion of the pipe.

2. A catheter as claimed in claim 1, in which the free pipe end is obliquely cut, the resulting tapered part being in the form of a lip invaginated into the pipe.

3. A catheter as claimed in claim 2, in which the invaginated lip is bent back on itself in an S-shaped configuration.

4. A catheter as claimed in claim 1, in which the free end of the pipe has a lateral aperture, this end being closed apart from this aperture.

5. A catheter as claimed in any of claims 1 to 4, in which the exterior of the tube has, in the end on which the pipe is mounted, a depression or projection over which the pipe end is secured by clamping means.

6. A catheter as claimed in any of claims 1 to 4, in which the tube and the pipe are integral with each other.

7. A catheter as claimed in any of claims 1 to 6, in which the tube is rigid or semi-rigid.

8. A catheter as claimed in claim 7, in which the tube is of plastics material.

9. A catheter as claimed in claim 1, in which the end of the tube remote from the connection with the pipe is connectable to a nozzle of a device for producing hydraulic pressure.

10. A catheter as claimed in any of claims 1 to 9, in which the pipe, when exserted, tapers towards the free end.

11. A catheter as claimed in any of claims 1 to 10, in which the wall thickness of the pipe decreases towards the free end.

12. A catheter substantially as described herein with reference to Figures 1 to 3 of the accompanying drawings.

13. A catheter substantially as described herein with reference to Figures 1 to 3 as modified by Figures 4 to 6.

MARKS & CLERK

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1 482 873 COMPLETE SPECIFICATION
3 SHEETS

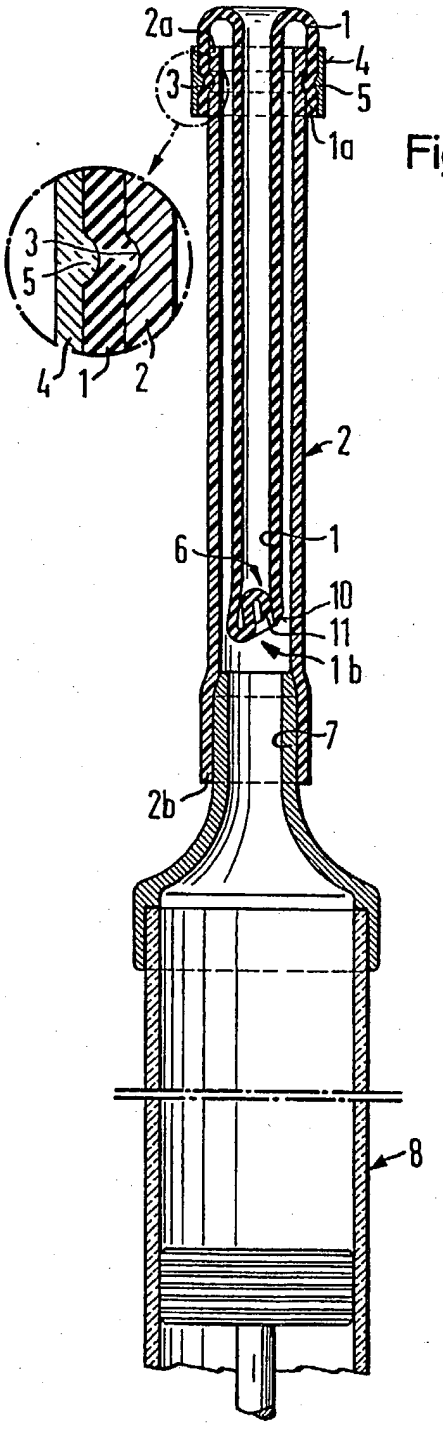

Fig.1

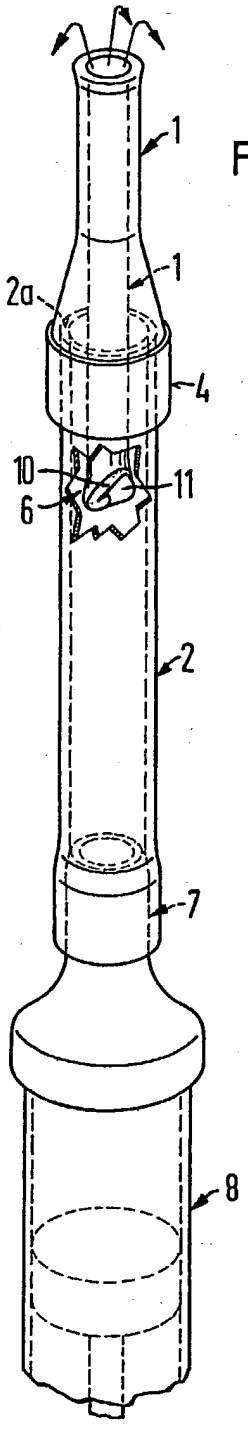

Fig.2

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3 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.

SHEET 2

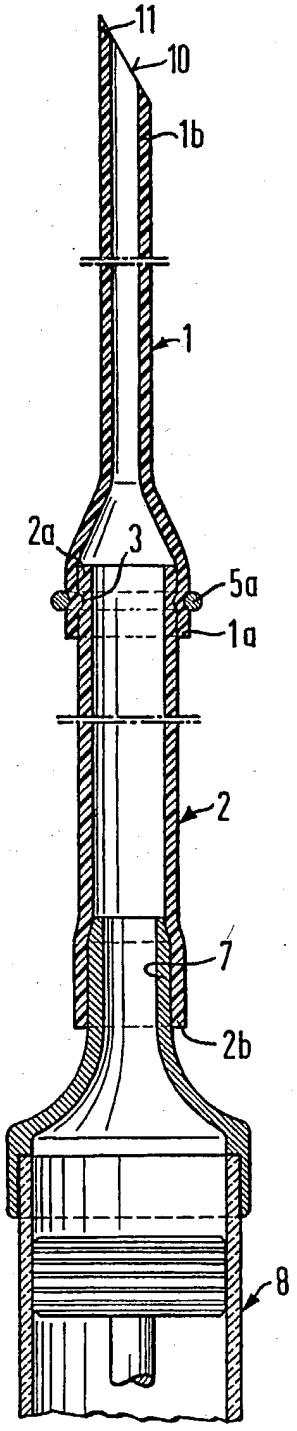

Fig. 3

1 482 873 COMPLETE SPECIFICATION
3 SHEETS

Fig. 4

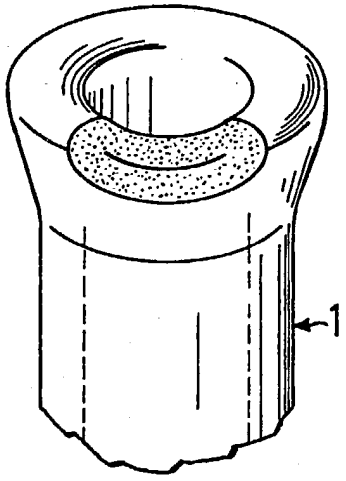

Fig. 5

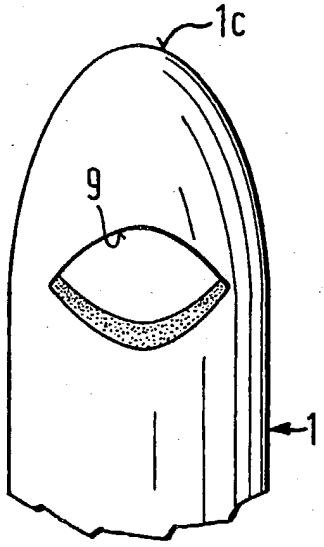

Fig. 6